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Investigation of the Deformation Activation Volume of an Ultrafinegrained Ti50Ni50 Alloy

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Abstract

© 2015 Springer Science+Business Media New York The mechanical properties, strain rate sensitivity (m) and deformation activation volume (ΔV) are investigated at the experimental temperatures from 20 to 400°C in a Ti50Ni50alloy in a coarse-grained (CG) state with the austenite grain size D = 200 μm and in an ultrafine-grained (UFG) state with D = 700 μm following an ECAP treatment. It is observed that this treatment improves the yield strength of the alloy compared to its CG-state. The strain rate sensitivity, m, is found to be by a factor of 1.5–2 higher than that of CG-specimens; it increases with the temperature in both states of the material. As the temperature of the material in tension increases up to T = 150–250°C, parameter ΔV increases to its maximum and with a further growth of the experimental temperature to 400°C, parameter ΔV decreases. The deformation activation volume of the alloy in the UFG-state is by a factor of 2–4 larger than that in the CG-state for the same experimental temperatures.

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Keywords

deformation activation volume, deformation behavior, nanocrystalline and ultrafine-grained structure, shape memory alloys, strain rate sensitivity of yield stress